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ENGINEERING EVALUATION / FACT SHEET

BACKGROUND INFORMATION

Application No.:	R13-1770B
Plant ID No.:	099-00021
Applicant:	American National Rubber Company
Facility Name:	Ceredo
Location:	Ceredo
NAISC Code:	326299
Application Type:	Modification
Received Date:	June 28, 2013
Engineer Assigned:	Edward Andrews
Fee Amount:	$1000.00
Date Received:	July 2, 2013
Completeness Date:	February 24, 2014
Due Date:	May 25, 2014
Newspaper:	*Wayne County News*
Applicant Ad Date:	July 17, 2013
UTMs:	Easting: 363.9 km Northing: 4,250.4 km Zone: 17
Description:	This action is part of the compliance plan outlined in Consent Order CO-R13-, 7,-E-2011-13.

DESCRIPTION OF PROCESS

American National Rubber Company's (ANR) Ceredo facility produces sheets of closed cell foam rubber. The process includes the addition of mixing compounds into a batch of non-vulcanized rubber (raw rubber), milling the raw rubber, forming the raw rubber into a ribbon and letting the material cool and rest, remixing the material and then re-milling and forming it into slabs with an extruder. The extrusion process creates/produces one or multiple slabs, depending on batch size, that weigh approximately 50 pounds each. After extruding the material it is in approximately a 50 pound slab with multiple slabs from one batch (depending on the batch size).

The slabs can rest for a period of time or may be taken directly to the platen press. The presses are heated with steam and the rubber undergoes its first expansion and fills the molds of the press in a process called compression molding. After the platen press, the rubber is passed through ovens to finish the expansion and to stabilize the material into a full bun of closed cell rubber. After cooling, the material is ready for sales or further fabrication at the site.

ANR sells the buns to others to process further into finished products and/or also processes buns at the facility. Processing of the rubber includes gluing of the buns together to produce a longer piece of rubber to be fabricated or slicing the buns to the dimensions needed by the customer. Longer pieces of rubber are sliced on several pieces of equipment. This equipment fabricates the proper dimension (width, length, and thickness). After fabricating the appropriate dimensions, lamination may occur. Lamination involves the application of a paper backed pressure sensitive adhesive (PSA) tape to the rubber. The PSA tape adheres to the rubber which will allow the end user to apply the rubber to a different product or sell the material as is for commercial or non-commercial use. The rubber qualities vary depending on the exact mixtures of the compounds but the end product is a closed cell rubber material. The qualities required by the finished product are based on the end use. This material is used in a wide range of products and different settings (gaskets, weather stripping, etc.). Multiple industries utilize the material of which the following is a sample listing: automotive industry, electrical enclosures, appliances, industrial and residential tools, construction, control panels, sporting equipment, heating/cooling industry, office equipment, lighting industry, anti-fatigue mats, etc.

SITE INSPECTION

On October 23, 2013, Mr. James Robertson, P.E; an engineer assigned to the Compliance and Enforcement Section; Mr. Fred Teel, an inspector assigned to the Compliance and Enforcement Section; and the writer conducted a site inspection of the facility. Mr. John Donato, President of ANR; Mr. Kevin Holderby, Plant Manager for the Ceredo Facility; Mr. Chris Smith, Technical Manager for the Ceredo Facility; and Mr. Patrick Ward, P.E. from Potesta & Associates, Inc.

One of the main purposes of this inspection is to follow-up on the measures taken by ANR to comply with the visible emissions standards of 45 CSR6 & 45 CSR 7 as required in Consent Order CO-R13, 7, E-2011-13. The other reason for the visit is to understand exactly what is being modified under the proposed application and how the source will be able to comply with the applicable rules.

This inspection consisted of a pre-meeting, walk-though, and a post-meeting. During the pre-meeting, questions about the visible emissions from the expansion ovens/ (RTO) stack (Emission Point 3E) and compliance with the standard was raised. ANR has elected to operate the RTO while any of the ovens are in operation regardless of the type of rubber being cured. The Consent Order allowed the ovens to be operated without the RTO in operation except when curing five different types of rubber as noted in Attachment A of the consent order. Based on the records of daily visible emission observations conducted by the facility, the RTO was exhibiting

zero visible emissions from the emission point. Thus, the curing ovens with the RTO were operating within compliance with the applicable visible emission standard of 45 CSR 6, which is less than 20 percent opacity.

Mr. Donato made it clear that the facility needs to switch from direct fired Koch ovens (No. 1 through 3) to steam heat ovens. These Koch ovens are approximately 11 feet by 20 feet by 7 feet, which is a huge volume. The sheets of rubber are moved through the oven (on movable racks that are pushed from one end to move the finished cart of cured rubber out the exit end of the oven. This oven design presents several challenges that the facility has not been able to successfully overcome. ANR believes that a steam heated oven design could shorten curing times and allow manufacturing operations to better control the oven temperature which would reduce curing defects. Most important factor, ANR believes that the facility would see a significant fuel cost saving by switching.

ANR's plan is to completely remove the Koch ovens and then locate the new steam ones in nearly the same location in Building 1. ANR would like to position the new ovens as adjacent to the presses as possible to streamline the manufacturing process. The facility currently operates a 500 boiler horsepower (bhp) boiler for the platen presses.

ANR has been researching and developing the use of steam heated ovens in their process for some time. Their research indicates that the visible emissions should be nearly zero opacity without the use of an add-on control device such as a thermal oxidizer.

ESTIMATE OF EMISSIONS BY REVIEWING ENGINEER

The applicant used pollutant emissions factors from Chapters 1.4 of AP-42 to estimate emissions from the natural gas fired boiler.

Table #2 – Emissions from the boiler

Pollutant	Natural Gas Boiler with a Design Heat Input of 21 MMBtu/hr		
	Emission Factor	Hourly Rate (lb/hr)	Annual Rate (TPY)
$PM/PM_{10}/PM_{2.5}$ Filterable	1.9 lb/MMcf	0.04	0.18
PM Condensable Fraction	5.7 lb/MMcf	0.12	0.39
SO_2	0.6 lb/MMcf	0.013	0.06
NO_x	100 lb/MMcf	2.06	7.18
CO	84 lb/MMcf	1.73	6.04
VOCs	5.5 lb/MMcf	0.11	0.39
Carbon Dioxide Equivalent (CO_{2e})	117.10 lb/MMBtu*	2459.1	10,770.86

* - CO_2 factor for Natural Gas list in Tables C-1 and C-2 of 40 CFR 98.

The manufacturing of rubber products at the Ceredo Facility involves five principal processing steps (mixing, milling, extrusion, curing, grinding). ANR calculated the proposed emission estimates using emission factors from the proposed (draft version) Chapter 4.12 of AP-42. ANR characterized the recipes used at the Ceredo Facility as to either ethylene-propylene-dienemethylene (EPDM) 1(sulfur cured) or emulsion styrene-butadiene rubber (SBR), which are referred to as Compound # 9 and #22 respectively in Chapter 4.12. However, AP-42 assumes that EPDM 1 is completely cured in the curing ovens. ANR uses the platen press then finishes curing in the oven all of its rubber products. In estimating the emissions using these factors, ANR had to use their best judgment in selecting emission factors for each process step. The writer agrees that the applicant's approach is the best without developing site specific emission factors using performance testing from each process, which is not reasonable for most of these process steps.

The mechanically created friction or externally added heat present during the principal process causes volatile organic compounds (VOC) and hazardous air pollutants to be generated. In addition, particulate matter is primarily emitted from the dry chemical (dry ingredients) utilized in mixing and mechanical sizing activities (grinding/buffering of rubber buns or sheets).

ANR estimated emissions by individual operations to a common stack or emission point. Annual emissions were based on a maximum annual production rate of 13,000,000 pounds of rubber produced per year. ANR used proposed emission factors (Draft) for Chapter 4.12 of AP-42. Hourly rates were based on the maximum hourly rate for each processing step, which ranged from 2,400 pounds of rubber per hour up to 4,800 pounds of rubber per hour. The following table is a summary of the emission estimates. ANR predicts that the Ceredo facility's annual production would be broken down to 67.2% of EPRM 1 rubber (8,736,000 lb per year of EPRM 1) and 32.8% of SBR (4,264,000 lb per year of SBR). The annual emissions were estimate using this annual production rates when specific emission factors for both types of rubber were available for the process operation (Mixing and Curing Ovens).

Table #3 Summary of Emissions from Rubber Manufacturing Using Draft AP-42 Factors

Pollutant	**PM***		**VOC**		**HAPs**	
Source	**lb/hr**	**TPY**	**lb/hr**	**TPY**	**lb/hr**	**TPY**
Mixing	1.35	2.93	0.37	0.56	0.17	0.25
Milling	N/A		0.002	0.003	0.001	0.002
Extruding	9.38E-5	1.52E-4	0.03	0.05	0.04	0.06
Platen Presses[1]	N/A		1.91	3.11	0.62	1.34
Curing Ovens[2]	N/A		14.11	14.60	8.36	9.69
Total	1.35	2.93	16.422	18.323	9.591	11.24

* - Uncontrolled Particulate Matter Emissions

1 – All Platen Presses are classified as fugitive sources.

2 – Includes the exhaust and fugitive door emissions from all of the curing ovens.

The main hazardous air pollutant (HAP) from the process is carbon disulfide, which is predicated to be generated mainly during the curing process step in the ovens. 9.51 tons per year of carbon disulfide is predicted to be released from the facility using the factors from AP-42. ANR uses Rubbermakers Sulfur, which is nearly 100% elementary sulfur, as the primary curing agent at the facility.

Based on the recipes listed in AP-42, the facility would have to use over 50 tons of Rubber Maker Sulfur to produce the 13,000,000 pounds of rubber per year. ANR's average recipes would call for less than 32 tons of the Rubber Maker Sulfur for the same annual production rate. This is a 27% decrease in the Rubber Maker Sulfur that would be used at the facility. Assuming the formation of carbon disulfide is linear to the amount of sulfur added, the writer adjusted the potential release of carbon disulfide to 6.01 tons per year from the ovens and 0.45 tons per year from the platen presses. This adjustment in carbon disulfide would change the facility's potential to emit of total HAPs to 7.47 tons per year from the rubber manufacturing process.

During the platen press and curing steps, energy is applied to the rubber to activate the sulfur to cure the rubber sheet, which expands it into a rubber bun at the end of the curing oven step. Because air (oxygen) is present at each of these process steps, the unreactive sulfur would most likely want to oxidize into sulfur dioxide rather than carbon disulfide. The writer predicted the sulfur dioxide basis on the amount of sulfur needed to from carbon disulfide by applying the sulfur added adjusting factor of 63.2% for ANR recipes, and assumed all of it is oxidized into sulfur dioxide. This would be just over 10 tons per year or just over 0.65 pounds of SO_2 per batch of 8 buns. Assuming the steam ovens process two batches per hour, the hourly SO_2 rate from the one steam oven would be 1.3 pounds per hour.

The rubber sheets (buns) are sometimes processed further at the Ceredo Facility in Building #2. The associated emissions from such activities are very limited to particulate matter (PM) and volatile organic compounds.

The tops/bottoms and sides of the buns are sliced or trimmed off. These cutting activities are conducted with special horizontal and vertical band saws and other special shears. The size sheet or square rubber block can be split into the desired thickness. There is a potential for PM to be generated. Such PM emissions would be reasonably contained by the building.

ANR can make rolls of rubber for certain costumers, which could be used as weather stripping. The sheets of rubber are glued together to form rolls. ANR estimates about 500 gallons of adhesive would be consumed with a VOC content of 78.9% by weight and a toluene content of 40%. This process would have the potential to release 1.4 tons per year of VOCs and 0.69 tons per year of toluene.

The following table is a summary of emissions from the facility based on a maximum production rate of 13 million pounds of rubber per year.

Table #4 Summary of Facility's Emissions			
Pollutant	Emissions after the Modification	Permitted Limits/PTE before Modification	Net Change in Emissions Limits (tpy)
$PM/PM_{10}/PM_{2.5}$	2.96	0.13	2.86
SO_2	10.16	10.23	-0.07
NO_x	7.18	15.95	-8.77
CO	6.00	8.00	-2.00
VOC	20.11	50*	-29.89
Total HAPs	8.16	5.15	3.01
CO_2e	10,770.86	21,028.45	-10,257.59

* - Is the facility permitted limit for total VOCs per year.

The emissions presented in the following table were mainly based on the information contained in the application except that Ovens 4 and 5 were not included. Ovens 4 and 5 has not been maintained or operated for several years and therefore the emissions from them were not included in the facility's current potential to emit. ANR plans on only utilizing the steam curing ovens once this modification is approved, which explains the reductions in most of the pollutants.

Originally, the facility's total VOC limit was based on the facility having the maximum potential to emit permitted at 163 tons per year without controls and using a thermal oxidizer with a 70% destruction efficiency. This original potential to emit was based on a mass balance method developed by the facility. The facility determined the mass losses from the platen presses and ovens and accounted for the moisture in the ingredients and non-VOC losses from decomposition of the blowing agent used to expand the rubber. The writer cannot explain the difference in potential based on the two methods.

REGULATORY APPLICABILITY

WV STATE RULES

45CSR2 To Prevent and Control Particulate Air Pollution From Combustion of Fuel In Indirect Heat Exchangers

&

45CSR10 To Prevent and Control Air Pollution From Emissions of Sulfur Oxides

These two rules establish emission limitations for smoke and particulate matter (Rule 2), and sulfur dioxide (Rule 10), which are discharged from fuel burning units. The existing boiler is a 21 MMBtu/hr (500 Bhp) Kewanee boiler fired only with natural gas. The agency recognizes that natural gas is a clean burning fuel and assumes "Type b" fuel burning units to be capable of complying with PM and visible emission limitations of Rule 2 and the sulfur dioxide limit of

Rule 10. In addition, 45CSR§2-11.1 and 45CSR§10-10.1 exempts the boiler from most of the applicable requirements of these two rules except for the visible emission standard of 45CSR§2-3.1. The agency recognizes burning of natural gas in boilers should not generate visible emissions and deemed it unnecessary to develop a monitoring plan to verify compliance with the visible emission standard.

45CSR7 To Prevent And Control Particulate Matter Air Pollution From Manufacturing Process And Associated Operations.

The Ceredo facility has been classified as a manufacturing process under Rule 7. Each source operation is subject to the process weight standard of 45CSR§7-4. and visible emission limitations of 45CSR§7-3. The following table was developed to better illustrate the limitations associated with each process operation.

Table #4 - Rule 7 Process Weight Sources

Source Operation	Emission Point	Process Weight (lb/hr)	Rule 7 Allowable PM (lb/hr)	Proposed PM Rate (lb/hr)	Visible Emission Standard (opacity)
Mixing	1E &2E	3,000	3.3	1.35	20%
Platen Presses	N/A	3,000	3.3	0	20%
Curing Ovens	4E though 9E	4,800	4.84	0	20%
Bun Processing Building 2	N/A	1,000	3.3	0.014	20%
Rubber Re-cycling* Building	N/A	1,000	1.8	N/A	20%

* Applicant proposed the allowable which is not acceptable. Activity cuts the rubber into ¼ size material, which is not classified as PM.

The only real issue with this facility being capable of complying with Rule 7 limitations is the visible emissions from the curing ovens. The source proposed to replace the gas fired ones with steam heated ovens without the thermal oxidizer. Currently, Armacel (087-00001) produces very similar rubber using steam heated ovens that normally exhibit little to no visible emissions without controls. ANR believes that the Ceredo Facility should be able to achieve the same level of control with the steam ovens.

45CSR21 – Regulation to Prevent and Control Air Pollution From the Emissions of Volatile Organic Compounds

The facility originally had a potential to emit over 160 tons of VOCs per year until the facility took a facility limit of less than 100 tons per year in Permit R13-1770, which was issued in January 23, 1995. In July of 1996, Rule 21 became effective and required facilities with

aggregate maximum theoretical emissions of 100 tons or more of VOCs per calendar year to prepare and submit a Reasonably Available Control Measures (RACM) plan that achieves at least a 90% reduction in VOCs from point sources.

The facility installed three new ovens with thermal catalytic oxidizers to control VOC emissions from the curing ovens. As a result of these changes, Permit R13-1770A was issued on January 20, 2000.

This action will not increase the potential VOC emissions over 100 tons per year before controls. Thus, the facility is not subject to Rule 21.

45CSR13 - Permits for Construction, Modification, Relocation and Operation of Stationary sources of Air Pollutants, Notification Requirements, Administrative Updates, Temporary Permits, General Permits, and Procedures for Evaluation

The potential to emit from the rubber manufacturing process exceeds the 6 pounds per hour and 10 tons per year for particulate matter and VOCs, which is the trigger level of a source as defined in 45CSR§13-2.24. Thus, the facility is required to obtain a permit as required in 45CSR-13.5.1.

The facility has met the applicable requirements of this rule by publishing a Class I Legal Advertisement in the *Wayne County News* on July 17, 2013, paid the $1000 application fee, and submitted a complete permit application.

The facility is classified as a minor source (i.e. has PTE of < 100 TPY of PM and VOCs; <25 TPY of HAPs) concerning applicability under Title V (45CSR30) and is not subject to a federal regulation. Thus, ANR is not required to obtain a Title V Operating Permit and is required to pay annual "Certificate to Operate" (CTO) fees as stated in 45CSR22 as a "9M" source, which it has been doing on an annual basis.

40 CFR 63 National Emission Standards for Hazardous Air Pollutants for Area Sources: Industrial, Commercial, and Institutional Boilers

This regulation establishes emission limitations for area sources (minor sources of HAPs) that operate boilers. Natural gas fired boilers are not an affected source under this regulation. Thus, the boiler at the facility is not subject to this regulation.

TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS

ANR claimed that the Ceredo Plant's potential to emit of hazardous air pollutants (HAPs) is less than half a ton per year. In determine the facility's HAP potential, ANR based the HAPs listed in the facility's chemical inventory (chemical compounds in the raw materials). This low HAP potential is due to the types of rubber manufactured at the Ceredo Facility.

During the application review process, the writer reviewed the list of Maximum Achievable Control Technology (MACT) regulations to ensure that there was no applicable regulation concerning this facility. As result, there was one possible regulation, Subpart OOOOOO for flexible polyurethane foam manufacturing. The regulation applies to foam manufacturing processes that use methylene chloride (i.e. blowing agent, etc.). The Ceredo Plant does not manufacture polyurethane foam. The AP-42 draft factors indicate there is a significant amount of carbon disulfide released from the rubber making process. U.S. EPA Integrated Risk Information System (IRIS) has not completed an evaluation of carbon disulfide and determination if carbon disulfide carcinogenic potential.

AIR QUALITY IMPACTS ANALYSIS

The writer deemed that an air dispersion modeling study or analysis was not necessary, because the proposed facility does not meet the definition of a major source as defined in 45CSR14.

MONITORING OF OPERATIONS

Monitoring of the facility is going to rely on visible emission checks (monthly/quarterly) and tracking daily rubber production rates. Because of the past compliance issues and the switching of the type of expansion ovens without controls, the permittee needs to make a demonstration that compliance with the visible emission standard is being achieved once the replacement ovens have been installed.

The writer proposed to have ANR identify the rubber recipes that exhibit visible emissions using Method 22. Then conduct follow-up observations using Method 9 to demonstrate compliance with to the Rule 7 standard. The proposed replacement ovens will not be equipped with a control device. Subsequent testing is not necessary, the standard monthly/quarterly visible emission check is being used as a means to ensure on going compliance.

Based on the estimated emissions in the application, the pollutant with any significant discharge rate would be VOCs. The main sources of VOC emissions would be from the platen presses and curing ovens. A special enclosure would have to be constructed to be able to measure the VOCs from the platen presses.

The exhaust side of the curing ovens accounts for over 56% of the total VOC emissions from the facility. Because the emission factors used to determine this potential has not been published and there is no other data available, the writer recommends that ANR conduct a performance test to demonstrate compliance with the VOC limit from at least one of the new curing ovens. Since this facility has no experience operating steam heated expansion oven, a 12 month window to conduct such testing was determined to be reasonable.

For volatile organic HAPs and sulfur dioxide, the permit creates emissions limits for these pollutants. Compliance for these limits is to tracking hourly and annual production rates and annual consumption of Rubber Makers Sulfur (curing agent).

CHARGES TO R13-1770A

Permit R13-1770A established PM emission limits for Emission Points DC1 and DC2 at 0.03 lb/hr with an annualized limit of 297.84 pounds per year; and a VOC limit for the whole facility of 50 tons per year to avoid Section 40 of 45 CSR 21. DC1 and DC2 are the emission points for the batch and warm up mixers, which the draft permit has them identified as 1E and 2E respectively. The actual PM emission limits were updated and retained in Condition 4.1.1.a.

However, the permit only cited the applicable sections of 45 CSR 7. Thus items b through f were established to identify what measures the source is taking to comply with applicable requirements or identify the emission points subject to the applicable visible emission limit.

The source of PM emissions from the mixers occurs when charging raw materials into the mixers. Thus, the writer believes the focus of limiting PM emissions from these mixers should be ensuring proper use of the collection system and dust collector when charging materials or operating the mixers. These emission points are subject to the visible emission standards of 45 CSR 7-3.1 (20 % Opacity Limit). The standard visible emission check should be sufficient for verifying compliance on a monthly basis with the option to go to a quarterly basis after consistent observations indicating zero visible emissions, which should be achievable with the current control device.

Item g in Condition 4.1.1. was established to identify the incinerator emission point that is subject to the visible emission standard of 45 CSR §6-4.3.

Permit R13-1770A established an annual VOC emission for the whole facility but did not establish any specific limitation or controls to ensure compliance. Condition 4.1.2. is established to set an annual VOC limit of 21 tons per year with individual VOC emission limits from the presses and gas fired ovens collectively and individually from the new steam ovens. Compliance for the new ovens will be based on one-time initial test and hourly production limit on a daily average basis for the hourly VOC limit.

The facility has always had a facility wide annual VOC limit to ensure that the facility had an enforceable limit that allowed ANR to avoid Section 40 of 45 CSR 21. However, the annual limit was never correlated to an annual production limit. The VOC limit in Condition 4.1.2., which is 21 tons per year, is based on an annual rubber production rate of 13,000,000 pounds.

RECOMMENDATION TO DIRECTOR

The information provided in the permit application indicates that compliance with all applicable regulations should be achieved. Therefore, the writer recommends that the Director grant a modification permit to American National Rubber Company for their rubber manufacturing process at the Ceredo Plant.

Edward S. Andrews, P.E.
Engineer

Date: August 26, 2014